This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

1.   (Previously Presented) A method of automatically detecting an occlusion in a fluid line of a syringe pump, the syringe pump including a housing adapted to support a syringe containing a plunger moveable inside the syringe by pushing an end of a plunger with a pusher to expel fluid from an outlet of the syringe into a fluid line connected to the outlet and configured to carry the fluid under pressure to a patient, the method comprising:

mounting the syringe onto the housing with the plunger end extended;

coupling the pusher to the end of the plunger;

initiating a pumping sequence to cause the fluid to flow into the fluid line;

during the pumping sequence, using a sensor to determine a first instantaneous force value F1 indicative of force in the fluid line at instantaneous time T1;

during the pumping sequence, determining a second instantaneous force value F2 indicative of force in the fluid line at instantaneous time T2; and

providing an indication of the occlusion if a slope calculated by dividing a difference between the second instantaneous force value F2 and the first instantaneous force value F1 by a difference between instantaneous time T1 and instantaneous time T2 departs from an expected slope relationship.

2.   (Previously Presented) The method of automatically detecting an occlusion of claim 1, further comprising providing no occlusion indication where the calculated slope does not depart from the expected slope relationship.

3.   (Original) The method of automatically detecting an occlusion of claim 1, further comprising determining a steady state condition.

4.   (Canceled)

5.   (Previously Presented) The method of automatically detecting an occlusion of claim 1, further comprising determining a time window defining at least one of time T1 and time T2.

6.   (Previously Presented) The method of automatically detecting an occlusion of claim 1, wherein providing the indication of the occlusion further includes determining the expected slope relationship.

7.   (Previously Presented) The method of automatically detecting an occlusion of claim 1, wherein providing the indication of the occlusion further includes determining a trial slope using at least one of the first and second instantaneous force values.

8.   (Original) The method of automatically detecting an occlusion of claim 1,

wherein providing the indication of the occlusion further includes determining an

occlusion slope.

9.   (Previously Presented) The method of automatically detecting an occlusion of

claim 1, wherein providing the indication of the occlusion further includes comparing the

expected slope relationship to the calculated slope.

10.   (Original) The method of automatically detecting an occlusion of claim 1,

wherein providing the indication of the occlusion further includes comparing an

occlusion slope to a trial slope.

11.   (Previously Presented) The method of automatically detecting an occlusion of

claim 1, further comprising shifting a time window to obtain an additional instantaneous

force value.

12.   (Original) The method of automatically detecting an occlusion of claim 1, further

comprising canceling the indication of the occlusion in response to a comparison between

a trial slope and a cancellation slope.

13.   (Previously Presented) A method of automatically detecting an occlusion in a

fluid line of a medical pumping system, the fluid line being configured to carry fluid

under pressure between a fluid source and a patient, the method comprising:

during a pumping sequence, determining a first instantaneous force value F1

indicative of force in the fluid line at instantaneous time T1;

during the pumping sequence, determining a second instantaneous force value F2

indicative of force in the fluid line at instantaneous time T2; and

providing an indication of the occlusion if a slope calculated by dividing a

difference between the second instantaneous force value F2 and the first instantaneous

force value F1 by a difference between instantaneous time T1 and instantaneous time T2

departs from an expected slope relationship.

14.   (Previously Presented) The method of automatically detecting an occlusion of

claim 13, further comprising providing no occlusion indication where the calculated slope

does not depart from the expected slope relationship.

15.   (Original) The method of automatically detecting an occlusion of claim 13,

further comprising determining a steady state condition.

16.   (Original) The method of automatically detecting an occlusion of claim 15,

wherein determining the steady state condition further includes determining a steady state

startup time period.

17.   (Original) The method of automatically detecting an occlusion of claim 16,

wherein determining the steady state condition further includes determining a startup

time limit.

18.　　(Original)　The method of automatically detecting an occlusion of claim 16, wherein determining the steady state condition further includes determining a startup fluid volume.

19.　　(Previously Presented)　The method of automatically detecting an occlusion of claim 13, wherein determining at least one of the first and second instantaneous force values further includes using a sensor.

20.　　(Previously Presented)　The method of automatically detecting an occlusion of claim 13, wherein determining at least one of the first and second instantaneous force values further includes determining a count indicative of the at least one of the first and second instantaneous force values.

21.　　(Original)　The method of automatically detecting an occlusion of claim 20, further comprising adjusting at least one of time T1 and time T2 to avoid fractioning the count.

22.　　(Original)　The method of automatically detecting an occlusion of claim 20, further comprising using a transducer to generate the count.

23.   (Previously Presented) The method of automatically detecting an occlusion of claim 13, further comprising determining a time window defining at least one of time T1 and time T2.

24.   (Original) The method of automatically detecting an occlusion of claim 13, wherein providing the indication of the occlusion further includes generating an alarm.

25.   (Previously Presented) The method of automatically detecting an occlusion of claim 13, wherein providing the indication of the occlusion further includes determining the expected slope relationship.

26.   (Previously Presented) The method of automatically detecting an occlusion of claim 13, wherein providing the indication of the occlusion further includes determining a trial slope using at least one of the first and second instantaneous force values.

27.   (Original) The method of automatically detecting an occlusion of claim 13, wherein providing the indication of the occlusion further includes determining an occlusion slope.

28.   (Previously Presented) The method of automatically detecting an occlusion of claim 13, wherein providing the indication of the occlusion further includes comparing the expected slope relationship to the calculated slope.

29.   (Original) The method of automatically detecting an occlusion of claim 13,

wherein providing the indication of the occlusion further includes comparing an

occlusion slope to a trial slope.

30.   (Previously Presented) The method of automatically detecting an occlusion of

claim 13, further comprising shifting a time window to obtain an additional instantaneous

force value.

31.   (Original) The method of automatically detecting an occlusion of claim 13,

further comprising canceling the indication of the occlusion in response to a comparison

between a trial slope and a cancellation slope.

32.   (Previously Presented) The method of automatically detecting an occlusion of

claim 13, wherein determining the first instantaneous force value further includes altering

delivery of the fluid.

33.   (Previously Presented) The method of automatically detecting an occlusion of

claim 13, wherein determining the first instantaneous force value further includes altering

delivery of the fluid in response to comparing the first instantaneous force value to a

bolus occlusion limit.

34.   (Previously Presented) The method of automatically detecting an occlusion of

claim 33, wherein determining the first instantaneous force value further includes

resuming delivery of the fluid after a delay time.

35.   (Previously Presented) The method of automatically detecting an occlusion of

claim 33, wherein determining the first instantaneous force value further includes

resuming delivery of the fluid in response to comparing the first instantaneous force

value to a bolus occlusion limit.

36.   (Original) The method of automatically detecting an occlusion of claim 13,

wherein providing the indication of the occlusion further includes initiating a remedial

action.

37-45. (Canceled)

46.   (Previously Presented) A syringe pumping system, comprising:

        a syringe configured to contain fluid and including an outlet;

        a housing adapted to support the syringe;

        a plunger having an end and configured to move within the syringe;

        a pusher adapted to attach to and push the end of the plunger so as to cause the

fluid to exit out of the outlet of syringe;

        a fluid line connected to the outlet of the syringe and configured to carry the fluid

under force to a patient;

        a sensor for determining at least first and second instantaneous force values F1

and F2 indicative of the force between the syringe and the patient taken at instantaneous

times T1 and T2, respectively; and

a processor in communication with the pusher, the processor being configured to execute program code that determines if a slope calculated by dividing a difference between the second instantaneous force value F2 and the first instantaneous force value F1 by a difference between instantaneous time T1 and instantaneous time T2 departs from an expected slope relationship.

47. (Previously Presented) The syringe pumping system of claim 46, wherein the program code initiates providing an indication of an occlusion if the calculated slope departs from the expected slope relationship.

48. (Previously Presented) The syringe pumping system of claim 46, wherein the program code initiates determining a time window defining at least one of time T1 and time T2.

49. (Previously Presented) The syringe pumping system of claim 46, wherein the program code initiates determining the expected slope relationship.

50. (Previously Presented) The syringe pumping system of claim 46, wherein the expected slope relationship includes an occlusion slope.

51. (Previously Presented) The syringe pumping system of claim 46, wherein the program code initiates comparing the expected slope relationship to the calculated slope.

52.   (Original) The syringe pumping system of claim 46, wherein the program code initiates comparing an occlusion slope to a trial slope.

53.   (Previously Presented) The syringe pumping system of claim 46, wherein the program code initiates determining a third instantaneous force value indicative of a force between the fluid source and the patient taken at times T2 and T3, respectively.

54.   (Previously Presented) The syringe pumping system of claim 46, wherein the program code initiates determining a third instantaneous force value indicative of a force between the fluid source and the patient taken at times T1 and T3, wherein T3 is subsequent to T2.

55.   (Previously Presented) A pumping system, comprising:

a fluid source;

a fluid line configured to carry fluid under pressure between the fluid source and a patient;

a sensor for determining at least first and second instantaneous force values F1 and F2 indicative of the force between the fluid source and the patient taken at instantaneous times T1 and T2, respectively;

a pump configured to generate a force between the fluid source and the patient; and

a processor in communication with the pump, the processor being configured to execute program code that determines if a slope calculated by dividing a difference

between the second instantaneous force value F2 and the first instantaneous force value

F1 by a difference between instantaneous time T1 and instantaneous time T2 departs

from an expected slope relationship.

56.   (Previously Presented) The pumping system of claim 55, wherein the program

code initiates providing an indication of an occlusion if the calculated slope departs from

the expected slope relationship.

57.   (Original) The pumping system of claim 55, wherein the program code initiates

determining a steady state condition.

58.   (Previously Presented) The pumping system of claim 55, wherein the program

code initiates determining a count indicative of the at least one of the first and second

instantaneous force values.

59.   (Previously Presented) The pumping system of claim 55, further comprising a

transducer configured to generate a count from at least one of the first and second

instantaneous force values.

60.   (Previously Presented) The pumping system of claim 55, wherein the program

code initiates determining a time window defining at least one of time T1 and time T2.

61.   (Previously Presented) The pumping system of claim 55, wherein the program

code initiates determining the expected slope relationship.

62.   (Previously Presented) The pumping system of claim 55, wherein a relationship

between the first and second force instantaneous values includes a trial slope.

63.   (Previously Presented) The pumping system of claim 55, wherein the expected

slope relationship includes an occlusion slope.

64.   (Previously Presented) The pumping system of claim 55, wherein the program

code initiates comparing the expected slope relationship to the calculated slope.

65.   (Original) The pumping system of claim 55, wherein the program code initiates

comparing an occlusion slope to a trial slope.

66.   (Previously Presented) The pumping system of claim 55, wherein the program

code initiates shifting a time window to obtain an additional instantaneous force value.

67.   (Original) The pumping system of claim 55, wherein the program code initiates

canceling the indication of the occlusion in response to a comparison between a trial

slope and a cancellation slope.

68.   (Original) The pumping system of claim 55, wherein the program code initiates

altering delivery of the fluid.

69.   (Previously Presented) The pumping system of claim 55, wherein the program code initiates altering delivery of the fluid in response to comparing the first instantaneous force value to a bolus occlusion limit.

70.   (Original) The pumping system of claim 69, wherein the program code initiates resuming delivery of the fluid after a delay time.

71.   (Previously Presented) The pumping system of claim 69, wherein the program code initiates resuming delivery of the fluid in response to comparing the first instantaneous force value to a bolus occlusion limit.

72.   (Previously Presented) The pumping system of claim 55, wherein the program code initiates determining a third instantaneous force value indicative of a force between the fluid source and the patient taken at times T2 and T3, respectively.

73.   (Previously Presented) The pumping system of claim 55, wherein the program code initiates determining a third instantaneous force value indicative of a force between the fluid source and the patient taken at times T1 and T3, wherein T3 is subsequent to T2.

74.   (Previously Presented) A pumping system, comprising:

        a fluid source;

a fluid line configured to carry fluid under force between the fluid source and a

patient;

a sensor for determining at least first and second instantaneous force values F1

and F2 indicative of the force between the fluid source and the patient taken at

instantaneous times T1 and T2, respectively;

a pump configured to generate the force between the fluid source and the patient;

and

a processor in communication with the pump, the processor being configured to

execute program code that initiates altering delivery of the fluid in response to

determining that a slope calculated by dividing a difference between the second

instantaneous force value F2 and the first instantaneous force value F1 by a difference

between instantaneous time T1 and instantaneous time T2 deviates from an expected

value.

75.   (Original) The pumping system of claim 74, wherein the program code initiates

determining if a bolus infusion is being delivered.

76.   (Original) The pumping system of claim 74, wherein the program code initiates

resuming the delivery of the fluid after a delay period.

77.   (Original) The pumping system of claim 74, wherein the program code initiates

resuming the delivery of the fluid at a reduced infusion rate.

78.   (Previously Presented) A syringe pumping system, comprising:

a syringe configured to contain fluid and including an outlet;

a housing adapted to support the syringe;

a plunger having an end and configured to move within the syringe;

a pusher adapted to attach to and push the end of the plunger so as to cause the

fluid to exit out of the outlet of syringe;

a fluid line connected to the outlet of the syringe and configured to carry the fluid

under force to a patient;

a sensor for determining at least first and second instantaneous force values F1

and F2 indicative of the force between the fluid source and the patient taken at

instantaneous times T1 and T2, respectively; and

a processor in communication with the pusher, the processor being configured to

execute program code that initiates altering delivery of the fluid in response to

determining that a slope calculated by dividing a difference between the second

instantaneous force value F2 and the first instantaneous force value F1 by a difference

between instantaneous time T1 and instantaneous time T2 deviates from an expected

value.

79.   (Original) The pumping system of claim 78, wherein the program code initiates

determining if a bolus infusion is being delivered.

80.   (Original) The pumping system of claim 78, wherein the program code initiates

resuming the delivery of the fluid after a delay period.

81. - 85.   (Canceled)